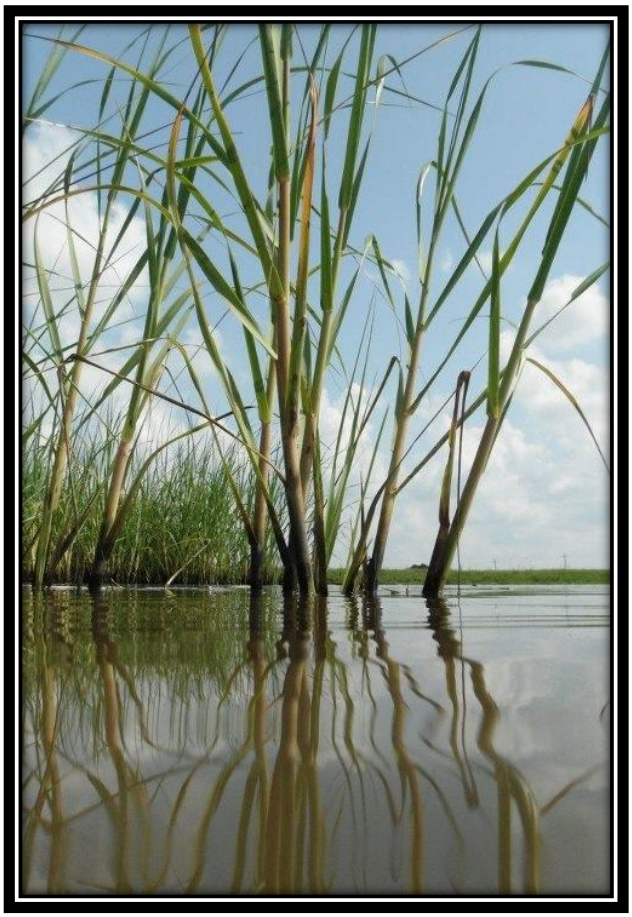
GOLDEN MEADOW PLANT MATERIALS CENTER

2013 ANNUAL TECHNICAL REPORT



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Helping People Help the Land...

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INTRODUCTION

The Mission of the NRCS Plant Materials Program is to develop and transfer plant materials and plant technology for the conservation of natural resources. In working with a broad range of plant species, including grasses, forbs, trees, and shrubs, the program seeks to address priority needs of field offices and land managers in both public and private sectors. Emphasis is focused on using native plants as a sustainable way to solve conservation problems and protect ecosystems.

The Golden Meadow Plant Materials Center (PMC) is funded and operated by the Natural Resources Conservation Service (NRCS), an agency of the United States Department of Agriculture (USDA). It is part of a national network of PMCs and Plant Materials Specialists (PMS) that are organized to form the NRCS Plant Materials Program. The purpose of the Plant Materials Program is to provide effective vegetative solutions to address conservation problems and needs. PMCs are located across the country to serve regional areas that have similar, but unique, natural resource conservation concerns and needs.

The Golden Meadow PMC was established because of a critical need to study and develop vegetative solutions and wetland plant technology for Louisiana's eroding coastal wetlands. Louisiana accounts for nearly 80% of the United States coastal land loss. It is estimated that Louisiana is losing 25-35 square miles of coastline each year. Coastal wetland remediation, restoration, and enhancement with vegetation have proven effective in retarding the conversion of marsh to open water, reducing erosion, and promoting the re-establishment of emergent vegetation.

To address coastal land loss and meet the objectives of the Plant Materials Program, the Golden Meadow PMC:

- Develops improved plants that will persist in a dynamic coastal marsh environment.
- Develops cultural techniques for the successful use of improved plant materials.
- Develops and transfers effective plant science technology that addresses critical wetland conservation needs.
- Releases and provides foundation plant materials for the commercial increase of improved conservation plants.
- Promotes the use of tested and proven plant materials to solve specific coastal wetland conservation problems.
- Serves as a learning center to stimulate and foster an understanding of the importance of plants in the environment and their role in conservation programs.

HISTORY

Coastal erosion and wetland loss in Louisiana are serious problems of national importance with long-term economic and social consequences. The progressive loss of Louisiana's coastal wetlands may deny Louisiana, the Gulf Coast region, and the nation

as a whole, of one of the most productive ecosystems in the world. With this in mind the NRCS realized a critical need for vegetative solutions to address coastal wetland loss and restoration.

It was during the late seventies that the NRCS initiated projects to evaluate the benefits of planting marsh grasses for erosion control and restoration of Louisiana's coastal wetlands. These plantings were successful in proving that establishing marsh grasses are an effective means of retarding the conversion of marsh to open water, to reduce the erosion of shorelines, canal banks, or other marsh-water interfaces, and to promote the re-establishment of emergent wetland vegetation. It was the success of these trial plantings that prompted the establishment of the Louisiana Marshlands Plant Materials Laboratory in 1985.

The Laboratory began as a collaborative effort of federal, state, and private entities. The Louisiana Land and Exploration Company provided 11.5 acres of land to develop the plant materials laboratory. The purpose of the facility was essentially to identify and collect selected native coastal wetland plant species and evaluate them for their potential use as conservation plants. The prevailing thought was that such a facility would provide a source of tested and proven plant materials that could be used in Louisiana's coastal restoration program.

With a vision and purpose firmly in mind, the physical features of the facility soon took shape. The facility began with the construction of fifteen shallow ponds in the late summer of 1985. Hurricane Juan delayed the completion of pond construction until April of 1986. The collection of plant materials had already began by the time pond construction was completed. Vegetative propagules representing each collection were planted directly to evaluation plots in the newly created ponds. The first plant species selected for study was smooth cordgrass (*Spartina alterniflora* Loisel.). This effort resulted in the first plant release in 1989. The new conservation plant selection was named 'Vermilion'. The benefits and success of planting 'Vermilion' for coastal restoration was evident soon after its release. This and other efforts prompted the U.S. Congress to authorize funding for the Laboratory and inclusion in the NRCS Plant Materials Program in 1989. The name was then changed to the Golden Meadow Plant Materials Center.

The Golden Meadow PMC facilities have continued to grow since 1989. Land improvements and structures now cover 92 acres. State-of-the-art facilities have been built that are used to develop, transfer, and promote coastal wetland plant science technology.

LOCATION AND FACILITIES DESCRIPTION

The Golden Meadow PMC is located in Lafourche Parish, Louisiana, approximately 70 miles southwest of New Orleans. This area is unique and of national significance as it lies within the Barataria-Terrebonne Estuary. This is the largest and most productive estuarine system in the United States. The Barataria-Terrebonne Estuary consists of over

6,300 square miles of swamps, expansive marshes, lakes, bays, and bayous. This is essentially a living laboratory from which to study and advance coastal wetland plant technology.

Facilities and equipment have been constructed and acquired to propagate and grow wetland plant materials for a variety of conservation uses. The PMC has 23 constructed ponds that range in size of 0.3 acres to 2.2 acres. There are 50 acres used for study plot and field scale plant increase. Facilities have been built with the capability to produce nearly any type of plant material needed for study plots on and off of the PMC. Off-Center plantings (e.g. Field Evaluation Planting - FEP) are used to test plant assemblies and selected plant materials in actual-use settings; sites that exhibit environmental conditions proposed for the intended use of the plant. Onsite facilities used for the increase of plant materials include:

- Three greenhouses totaling 6,180 square feet.
- Plant propagation and production facility.
- Shadehouse structures totaling 5,520 square feet.

An Office/Conference facility is available for PMC operations and is used as a learning center. The Conference facility consists of a 2,016 square foot meeting room and a dormitory that will house up to 32 people. The intended use of the conference facility is to foster an understanding of the importance of coastal wetlands and conservation plants and to provide a forum for the exchange of coastal wetland issues, knowledge, and ideas.

CLIMATE AND SOILS

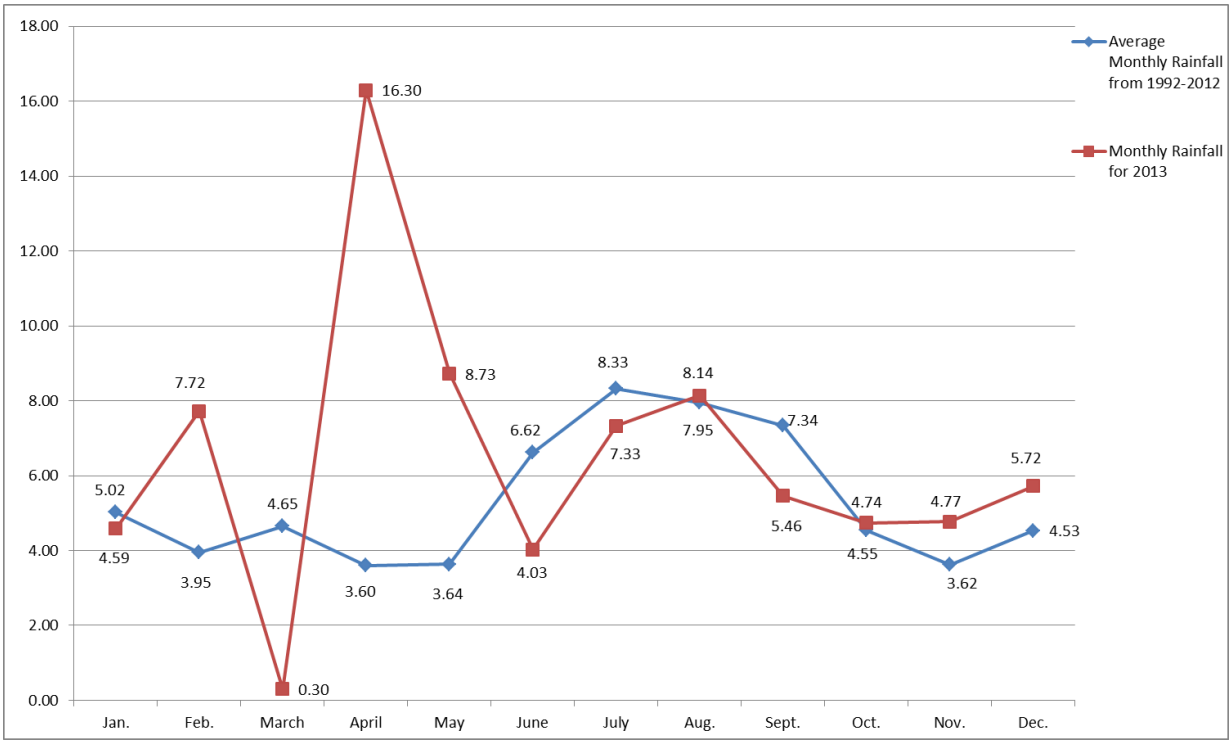
CLIMATE: The long summers are hot and humid but frequently cooled by breezes from the Gulf of Mexico. Winters are warm and only briefly interrupted by incursions of cool air from the north. Rainfall occurs throughout the year and precipitation is adequate for all crops. In winter the average temperature is 54° F and the average daily minimum temperature is 44° F. The average annual precipitation is 62 inches. Nine out of ten years there will be 245 days of temperatures above 32° F. There is sunshine on an average of 60% of the time during the winter. The prevailing winds are from the southeast.

Precipitation Data

Table 1 Golden Meadow Plant Materials Center Rainfall (inches) from 1992-2013

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Totals
1992	11.00	5.75	5.15	3.55	1.10	10.58	7.70	7.00	0.00	0.00	4.00	6.00	**61.83**
1993	8.50	3.45	7.50	6.45	7.15	5.70	9.15	5.80	7.70	6.15	5.05	5.10	**77.70**
1994	5.35	1.60	2.60	6.60	3.50	10.56	6.86	13.15	2.79	8.63	0.71	1.20	**63.55**
1995	4.15	1.07	9.31	0.61	4.49	3.64	9.66	3.26	1.74	3.33	5.30	0.69	**47.25**
1996	5.45	0.00	2.65	3.09	1.32	3.50	4.83	6.82	5.61	1.69	1.14	7.32	**43.42**
1997	0.00	8.91	2.38	3.05	11.71	7.86	9.69	2.27	5.52	3.66	9.49	2.53	**67.07**
1998	20.45	7.59	8.66	2.83	0.02	3.12	3.96	3.28	28.48	1.75	6.65	4.93	**91.72**
1999	2.42	2.66	5.91	0.04	1.99	8.08	6.41	4.20	10.35	4.10	2.25	3.95	**52.36**
2000	3.46	0.41	6.11	0.20	0.45	9.54	3.29	2.14	8.11	7.19	9.38	3.50	**53.78**
2001	0.00	0.00	2.38	0.27	0.60	13.18	8.85	7.97	12.01	4.39	4.70	3.90	**58.25**
2002	5.16	2.77	3.06	4.63	0.64	4.57	6.37	8.69	13.66	15.37	3.39	0.85	**69.16**
2003	0.12	3.60	9.26	2.50	1.46	17.74	7.19	6.33	6.22	3.53	2.34	4.22	**64.51**
2004	6.96	6.55	0.64	13.10	3.96	9.98	7.02	4.13	0.86	14.99	4.31	6.57	**79.07**
2005	4.51	7.58	8.38	8.18	7.61	2.45	13.74	18.59	4.00	0.08	1.93	2.40	**79.45**
2006	3.64	1.83	0.31	3.37	1.45	1.80	9.46	8.95	4.02	3.00	1.30	14.65	**53.78**
2007	6.53	0.75	1.65	1.50	8.29	5.69	9.83	7.00	6.06	5.75	2.80	7.50	**63.35**
2008	7.70	7.40	3.40	3.65	5.26	6.66	8.40	9.85	10.95	2.10	1.50	1.29	**68.16**
2009	1.05	3.04	1.95	1.06	7.12	2.97	11.10	8.60	4.40	7.50	1.34	13.18	**63.31**
2010	2.95	10.74	4	1.32	2.55	6.67	4.92	21.79	2.45	1.85	5.42	1.95	**66.61**
2011	4.58	2.47	4.35	0.20	0.14	0.50	16.90	2.96	12.45	0.40	1.75	0.93	**47.63**
2012	1.52	4.80	7.97	9.35	5.59	4.16	9.59	14.21	6.70	0.00	1.24	2.52	**67.65**
Month Means	**5.02**	**3.95**	**4.65**	**3.60**	**3.64**	**6.62**	**8.33**	**7.95**	**7.34**	**4.55**	**3.62**	**4.53**	**63.79**
2013	4.59	7.72	0.30	16.30	8.73	4.03	7.33	8.14	5.46	4.74	4.77	5.72	**77.83**

Figure 1 Monthly 2013 and average rainfall from 1992-2012



SOILS: The Golden Meadow Plant Materials Center is located on soils of mineral and organic consistency. The soils series names and descriptions follow.

- **Allemands series** consists of poorly drained and very poorly drained organic soils that formed in moderately thick accumulations of decomposed herbaceous material overlying clayey alluvium. These soils are in freshwater coastal marshes. Unless drained, they are ponded and flooded most of the time. Elevation ranges from about 1-ft. above sea level to six-ft. below sea level. Slope is less than 0.5%.

- **Sharkey series** consists of poorly drained, very slowly permeable, firm, mineral soils that formed in clayey alluvium. These soils are on low and intermediate positions on the natural levees of Bayou Lafourche and its tributaries. Elevation ranges from about 1-5 ft. above sea level. Slope is less than 1%.

- **Rita series** consists of poorly drained very slowly permeable, firm mineral soils that have subsoil that is permanently cracked in the upper part. These soils formed in thin, herbaceous material over clayey alluvium. They are in freshwater marshes that have been drained and protected from flooding. Elevation ranges from 2-6 ft. below sea level. Slope is less than 0.5%. Rita soils commonly are near Allemands muck, drained, Rita Variant, Sharkey and Tunica soils.

SERVICE AREA

The Golden Meadow PMC service area of responsibility includes the coastal area of Mississippi, Louisiana and southeast Texas. Major Land Resources Areas within the center's service area include: 131A Southern Mississippi River Alluvium (southern portion); 134 Southern Mississippi Valley Loess (southern portion); 150A Gulf Coast Prairie; 151 Gulf Coast Marsh; and 152A Eastern Gulf Coast Flatwoods.

PLANT MATERIALS CENTER OPERATIONS

Plant Species Selection, Evaluation and Release

The PMC has the responsibility to assemble, test, release, and provide for the commercial production and use of conservation plants developed by the Center. Plant studies and species selection is based on ecological and conservation needs of the service area. Vegetative plant materials or seed of selected species are collected from native populations throughout the area of intended use for assembly. Commercial sources and established cultivars are included in assemblies if available. Each plant collection (accession) is given an identification number. The assembly forms a base population from which a selection nursery is established. All assemblies are established on the PMC for comparative evaluation. Assemblies are also established off Center to field evaluation planting (FEP) sites. FEPs are selected to represent actual use conditions for the desired use of the conservation plant. Plant performance criteria are determined and gathered from all planting sites over a specified period of time, generally several years. Superior performing plant materials are then selected based on the performance criteria.

The top 10-20 % of the best performing plants are selected from the assembly. Selections are then increased vegetatively or by seed to provide plants for further testing. Enough plants are produced for planting to replicated plots on and off the Center. Advanced testing of the superior plants may be sufficient for release or several cycles of recurrent phenotypic selection may be needed before a release is made.

After thorough testing and documentation of superior performance, improved or selected plants may be released to the public, i.e., made available for commercial plant increase. Techniques to improve the successful use of plant releases such as establishment methods, culture, management, production, suitable use and range of adaptation are also made available. Names are given to new plant varieties, i.e., pre-varietal and cultivar releases. Cultivar names aid in the selection of appropriate varieties for use in conservation plantings. The cultivar name can be used to define the limits of performance expected of any plant variety in any environment.

Plant Materials Releases

'Vermilion' smooth cordgrass (*Spartina alterniflora*) was released for commercial production in 1989. 'Vermilion' originates from a population of native plants collected from Vermilion Parish, Louisiana. The 'Vermilion' ecotype was selected for its superior performance in comparative evaluation trials of over 89 accessions collected from throughout the Gulf of Mexico basin. 'Vermilion' is a native, herbaceous, warm-season, perennial grass that forms dense colonies along shorelines and intertidal flats of coastal wetlands. It is a robust and vigorously spreading plant that tolerates diurnal tidal inundation and relatively high salinities. 'Vermilion' is an important cultivar used to maintain the stability of saltwater marshes and shorelines. 'Vermilion' is recommended for shoreline, canal bank, levee, and intertidal erosion control. This cultivar is also an effective soil stabilizer on interior tidal mudflats, dredge fill sites, and other areas of loose and unconsolidated soils associated with marsh restoration. 'Vermilion' smooth cordgrass is a sustainable and renewable restoration resource. When properly established in the appropriate habitat, this cultivar will persist providing an important conservation tool for coastal restoration and preservation.

Pelican Germplasm black mangrove (*Avicennia germinans*) was released for commercial production in 1995. Pelican is a source-identified germplasm pre-varietal release. Pelican Germplasm black mangrove was released to provide a locally adapted and known ecotype for use on Louisiana's coastal marshes and barrier islands. It is a neo-tropical shrub that grows in salt marshes near high tide elevation. Pelican serves as a sediment stabilizer, contributes leaf biomass to the marine food chain and detrical cycle, and provides habitat for numerous biological organisms. It is an important vegetative component for pelican nesting habitat found on Louisiana's barrier islands. Pelican black mangrove is recommended for planting on protected intertidal flats and shorelines of Louisiana's saline marshes, shorelines of protected shallow bays, and marshy barrier islands.

Fourchon Germplasm bitter panicum (*Panicum amarum*) was released for commercial production in 1998. Fourchon is a selected class pre-varietal release. Fourchon Germplasm bitter panicum is recommended for beach dune enhancement and stabilization on coastal beaches and barrier islands of the north central Gulf of Mexico basin. Fourchon is an early colonizing species that can tolerate the harsh environments of the dune system which is subject to salt spray, storm surges, occasional inundation, high temperatures, low soil moisture and fertility, sand abrasion, and smothering by drifting sand. The above ground portion of the plant reduces wind velocity allowing sand to drop out of the wind stream and accumulate. The below ground portion of the plant stabilizes and holds the sand in place with an extensive fibrous root and rhizome system. Fourchon bitter panicum was selected for its vigorous growth, persistence after storm events, and performance in stabilizing dunes enhanced or created with sand fencing structures.

Brazoria Germplasm seashore paspalum (*Paspalum vaginatum*) was released for commercial production in 1999. Brazoria is a selected class pre-varietal release. Brazoria Germplasm seashore paspalum is a perennial semi-aquatic, warm season, native grass. A dense sod-like turf is formed from an extensive system of rhizomes and stolons. Seashore paspalum is an effective pioneering plant that can be used in coastal restoration and conservation programs. It spreads rapidly and can be established on fresh to brackish soils with salinities to 10 parts per thousand. Brazoria is recommended for intermediate to brackish marshes, shorelines, coastal beach dunes, canal banks, mudflats, dedicated dredge materials, and areas of ephemeral soil deposition.

Caminada Germplasm seaoats (*Uniola paniculata*) was released for commercial production in 2001. Caminada is a sourced identified release. Caminada Germplasm seaoats is a warm season native perennial grass that spreads primarily by rhizomes. It is recommended for beach dune enhancement and stabilization on coastal beaches and barrier islands of the north central Gulf coast, primarily Louisiana west of the Mississippi River. This release has demonstrated characteristics that allow it to grow and persist on beaches subject to storm surge overwash, sites affected by salt spray and rapidly accreting sand that is arid and low in fertility.

'Gulf Coast' marshhay cordgrass (*Spartina patens*) was released for commercial production in 2003. 'Gulf Coast' is a cultivar release. 'Gulf Coast' marshhay cordgrass is native, warm season perennial grass that grows to 122 cm in height and spreads primarily by rhizomes. It is recommended for conservation plantings in coastal areas of the north central Gulf of Mexico basin. 'Gulf Coast' has proven effective for marsh restoration, shoreline and levee stabilization, and coastal beach and barrier island sand dune enhancement and stabilization.

Timbalier Germplasm gulf bluestem (*Schizachyrium maritimum*) was released for commercial production in 2006. Timbalier is a selected release. Timbalier Germplasm Gulf bluestem is native warm-season perennial grass that spreads by seed and short rhizomes. Plants are rhizomatous and colonial, stems usually decumbent, glacous, reddish, and flattened at the base, terminal inflorescences with stalked spikelets. This species is found native to coastal and offshore islands of the Florida panhandle west to Louisiana. It is recommended for beach and barrier island plantings of the north central Gulf coast. Gulf bluestem is potentially imperiled in Louisiana because of its rarity and factors that make it especially vulnerable to extirpation. Gulf bluestem is an important species on dunes, beaches, and barrier islands to combat erosion and added species diversity.

Bayou Lafourche Germplasm California bulrush (*Schoenoplectus californicus*) was released for commercial production in 2007. Bayou Lafourche is a selected release. Bayou Lafourche Germplasm California bulrush is an herbaceous, native rhizomatous perennial that forms dense vegetative colonies along shorelines, in open water, or on mudflats. California bulrush is an emergent wetland plant that spreads primarily by vegetative propagation, producing new stems from an extensive system of underground rhizomes, or, to a limited extent, through seed dispersal. An important characteristic of California bulrush is that it can grow in relatively deep water. It is not uncommon for extensive colonies to grow in 36 inches or more of water. Bayou Lafourche Germplasm has a fair tolerance to intermediate marsh habitats (salinity 0.5 to 3.5 ppt.) and a low tolerance to brackish marsh habitats (salinity 3.5 to 10.0 ppt.). Bayou Lafourche Germplasm is recommended for erosion control along shorelines, canal banks, levee banks, and other areas of soil-water interface. California bulrush maybe used in the creation and restoration of wetlands, to improve water quality, and reduce suspended sediments. It also provides habitat for mammals, birds and fish that visit the sites and promote establishment zones for many submerged aquatic plants.

Cajun Sunrise Germplasm ashy sunflower (*Helianthus mollis*) was released for commercial production in 2012. Cajun Sunrise is a selected plant material cooperatively released with the Golden Meadow Plant Materials Center (PMC), East Texas PMC and the Louisiana Native Plant Initiative (LNPI) partners. Cajun Sunrise Germplasm ashy sunflower is a native, warm-season, perennial forb occurring naturally in grassland habitats over much of the central and eastern U.S. Ashy sunflower is a dicot of the family Asteraceae typically found growing in well-drained soils and full sun. Stems are erect, solitary or clustered, densely pubescent gray, growing from rhizomes to 1.2 m tall. Leaves are opposite, stiff, ascending, sessile and clasping with a rough-hairy grayish-green surface to 12 cm long and 8 cm wide. Leaf margins are entire to shallowly toothed with a pointed tip. Inflorescence consists of single flower heads terminating on upper stems. Flowers exhibit 15-30 yellow petals (sterile ray florets), 2.5-3 cm long encompassing fertile yellow disk florets compressed to 2.5 cm in diameter. Each disk floret has a glabrous corolla tube to 6 mm long, and 5 stamens with whitish filaments and dark-brown anthers. Fruits are achenes that are wedge shaped, dark-brown or black, and tipped by two scales with pointed tips each enclosing a small single seed 3-6 mm in length. Ashy sunflower is hardy, tolerant to fairly extreme climatic conditions in the southern US, and is a prolific seed producer. Cajun Sunrise Germplasm ashy sunflower

will provide a commercially available ecotype primarily for the use on gulf coast prairie, and other areas across the southern US where it historically persists. Cajun Sunrise Germplasm ashy sunflower is beneficial for vegetative restoration, wildlife food and cover and pollinator attraction.

STUDIES

Active Studies

Study: LAPMC-P-1003-WE

Study Title: Evaluation of *Spartina spartinae* accessions for improved seed germination and viability for central Gulf Coast restoration.

Study Leader: Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA

Introduction

Factors limiting the widespread acceptance of gulf cordgrass (*Spartina spartinae*) as a conservation plant include; poor seed viability; and having to rely on labor intensive and expensive asexual production to produce plants for re-vegetation projects. Having a dependable seed source would greatly increase the ability to establish more acreage at a lower cost.

Gulf Cordgrass (*Spartina spartinae*) (Trin.) Merr. ex Hitchc. is a native, perennial grass that grows in dense clumps along the Gulf Coast from Florida to Texas. Gulf cordgrass commonly grows in coastal marshes above the intertidal zone. More rarely, it can be found growing in saline soils associated with inland marshes and moist prairies.

Problem

Coastal erosion and wetland deterioration are serious and widespread problems affecting Louisiana's coastal zone. With coastal wetland losses of 16,000 to 20,000 acres per year in Louisiana, the need for commercial available plants used on large and small scale restoration projects is increasing.

Objective

Study is to develop a dependable seed producing line using 65 collections from Texas and Louisiana. In 2000, 31accessions identified with elite parentage based on environmental stresses and seed characteristics was planted in a randomized complete block design at the Golden Meadow Plant Materials Center in Galliano, Louisiana. Seed was collected from the 31 accessions from four replications in Oct/Nov, cleaned and stored seed at room temperature. Replicated germination test will be used to select potential parent materials that will produce the highest seed quantity and quality with improved germination.

Materials and Methods

In 2001, land where evaluation block was established was sold and individual accessions were extirpated and re-established in a nearby field. Off center evaluation site was established on Grand Terre Island, east of Grand Isle, LA. 3 randomized complete block designs were established using the complete assembly of gulf cordgrass.

Gulf cordgrass was evaluated in 2002 and again in 2003 to measure height, spread, plant vigor, and seed production. It was noted that visual evaluations for accession 9068190 expressed more favorable plant vigor and spread.

In 2007, complete assembly of gulf cordgrass was transplanted to 4 inch containers for advanced study increase. Establishment of randomized study plots located at the center was established in 2009. For 2010, no evaluations were taken due to unseasonably wet growing conditions and the time needed for plant maturity.

Sixty-five collections of *S. spartinae* were sampled from coastal southwest Louisiana to coastal southeast Texas. In 1985 these plants were transplanted in an observational nursery in Galliano, LA. 31 of the plants were chosen because of elite parentage and phenotypical appearances. 31 plants were then subdivided and placed in a randomized complete block design at the PMC, replicated 5 times. Plant spacing is approximately 6 feet and mechanical rotor tilling is the method performed to keep the plants isolated from one another. Herbicides are applied throughout the year for weed suppression. Annual prescribed burning is performed in the late winter of the year to remove decomposing vegetation and to promote new growth. *S. spartinae* is a perennial plant and grows vegetatively and produces seed throughout most of the year. Overall seed maturity was determined in November when the majority of seed began to shatter. Seed was collected by using bypass hand pruners to detach seed culms from individual plants. Seed culms from 4 of the 5 blocks were collected and placed into paper bags, then labeled by plot (block number) and accession number. Seed was hand stripped from seed culm and screened to separate seed from other debris. Seed was further cleaned using a South Dakota seed blower with a 1.5 cm opening setting and blown for 12 seconds using air for precision seed separation. Cleaned seed from each accession were stored in standard paper envelopes that were labeled for identity to distinguish respective plot and accession numbers.

Seed was stored at room temperature (70^0 +/- 5^0 F) in paper envelopes for 1 month. 50 seed per accession was then hand counted using a fluorescent light table. 50 seed per accession was then placed in standard size (100mm x 15mm) plastic Petri dishes lined with blotter paper. 4 replications of initial accessions collected in each of the 4 blocks were further plated. Seed was spaced in the dishes in a fashion that gave all the potential to germinate. Deionized water was used to irrigate the Petri dishes for moisture. The Petri dish lids were labeled by accession number, plot number and repetition number. Petri dishes were then placed at random in a Percival germination chamber. Chamber settings were 16 hours dark at 68^0 F and 8 hours light at 86^0 F. Germination was determined when radicle elongated from seed. Counts were made every 7, 14, 21 & 28 days and germination data was recorded. After the 28th day seed was placed in cold storage (38 -41^0 F) for 2 weeks to potentially break dormancy. Seed was then placed back into germination chambers and counts were again performed 7 (7C) and 14 (14C) days, respectively thereafter. This process was repeated 3, 6 and 12 months after harvest from field. Seed was stored at room temperature for the duration of the study's completion. Germination data was subjected to ANOVA and least significant difference test ($P<0.05$) to compare means.

Results and Discussion

Figure 1 depicts a bar graph representing percent germination of *S. spartinae* by accession. Germination percentages for each accession were averaged for the 7, 14, 21, 28, 7C and 14C counts at the 1, 3, 6 and 12 month germination intervals. Significant differences LSD ($P<0.05$) in germination were detected amongst accessions. The highest percent germination was 54 % and occurred for accession 68195 at seed age = 3 months and day count = 14.

Figure 2 depicts a bar graph representing percent germination of *S. spartinae* by seed age. Germination percentages of all accessions were averaged at the 1, 3, 6 and 12 month germination intervals. As seed age increased after 3 months, overall germination trended downward. Significant differences LSD ($P<0.05$) of seed age were detected amongst the 1, 3, 6 and 12 month storage intervals. Seed stored at room temperature could have potentially been a function of seed germination.

Figure 3 depicts a line graph representing peak germination of *S. spartinae* across 1, 3, 6 & 12 month ages of seed. For all seed ages, peak germination occurred at the 14 day germination count.

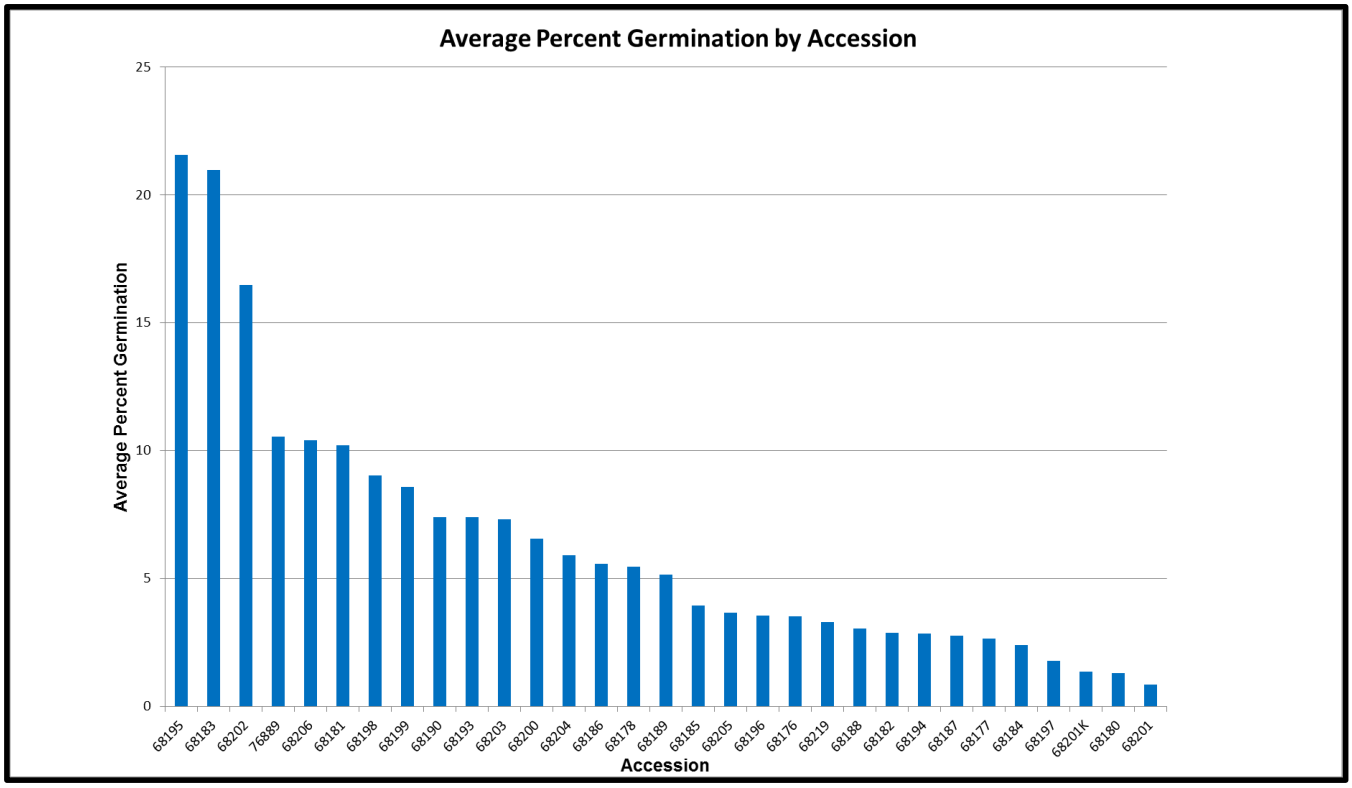


Fig. 1 Average Percent Germination by Accession

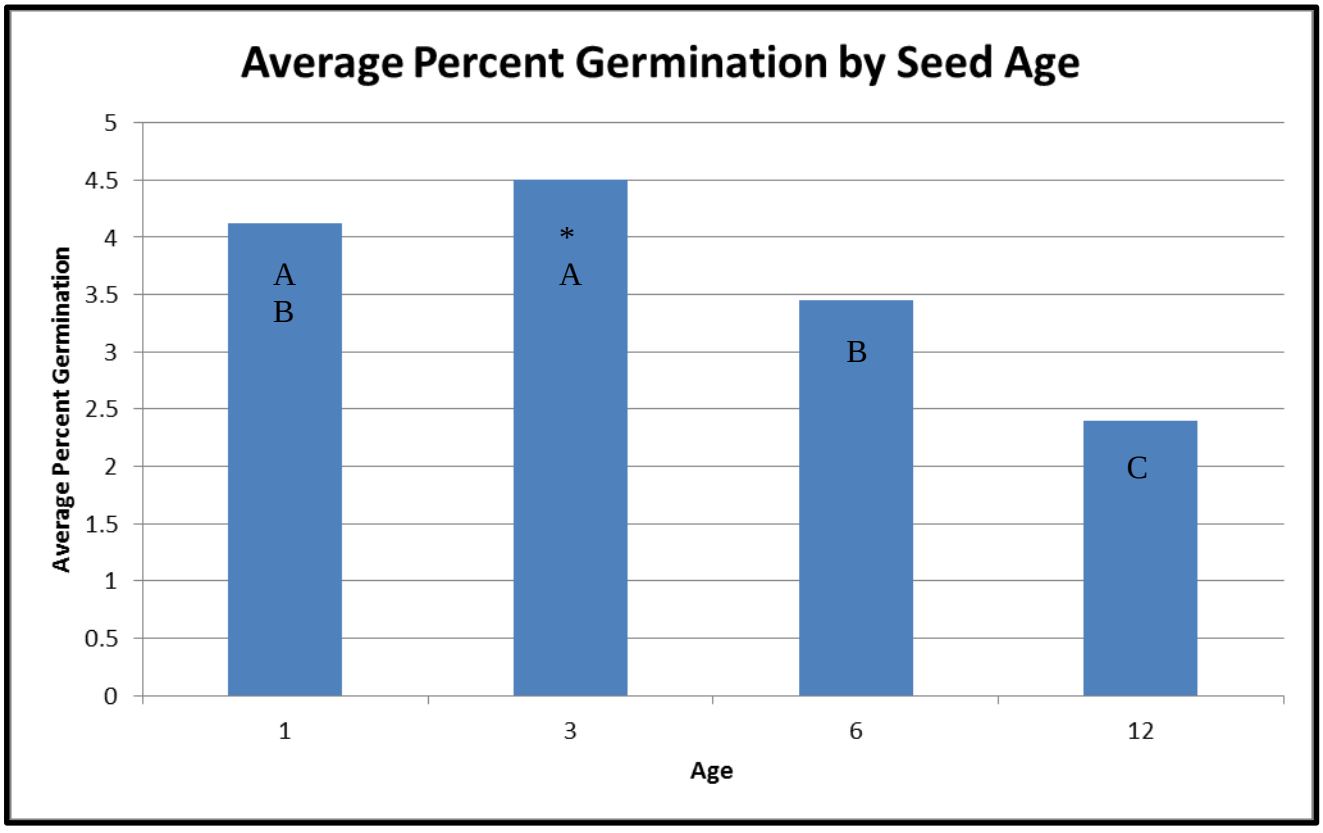


Fig. 2 *Means with same letters are not significantly different at 5% level of probability

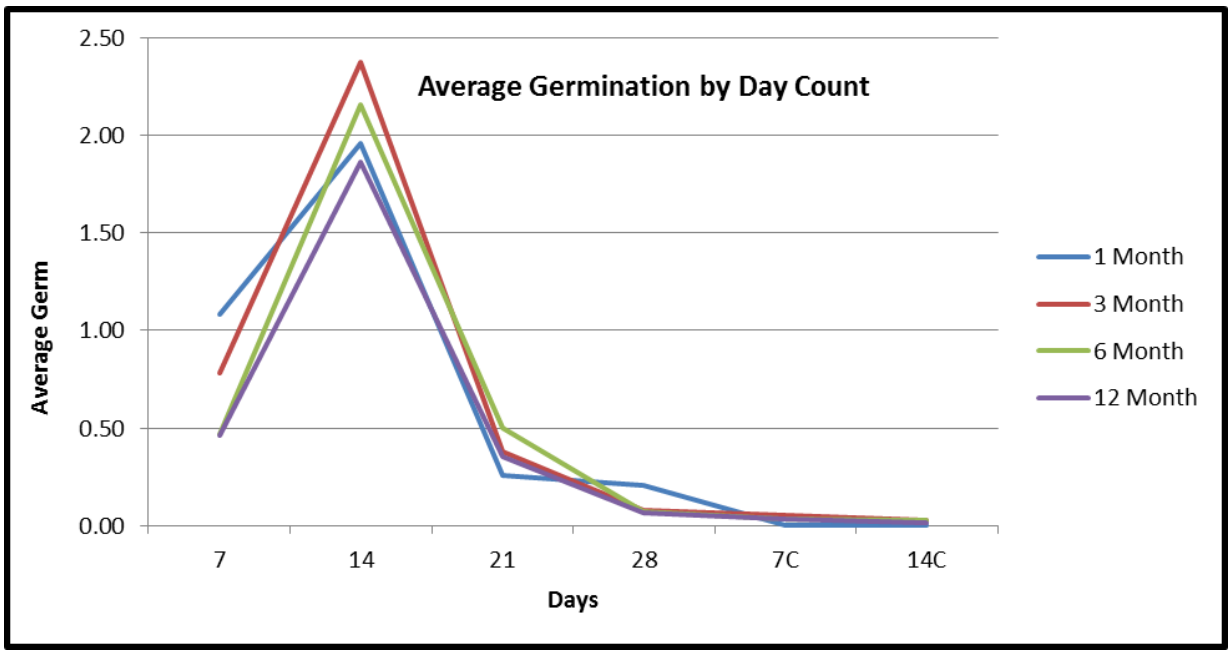


Fig. 3 Average Germination by Day Count

Study: LAPMC-P-0103-OT

Study Title: Chitimacha Tribe of Louisiana - Re-establishment of River Cane on Tribal Lands

Study Leader: Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA
Morris Houck, NRCS Plant Materials Specialist, LA

Cooperators: Patra Ghergich, NRCS Franklin Field Office, LA
Kim Walden, Chitimacha Tribe of Louisiana, LA

Introduction
Conservation of an ancient cultural tradition motivated the Chitimacha Tribe of Louisiana in their request for PMC assistance. The Chitimacha are the oldest recognized and indigenous tribe in Louisiana and have used river cane (*Arundinaria sp.*) in developing unique and alluring woven baskets and mats since the era of the Mississippi mound-building culture, a tradition dating back to the Middle Ages. *Arundinaria* is also known as giant cane, switch cane or bamboo.

The Chitimacha's dedicated most of their efforts to cultivating the soil, fishing, and developing the domestic arts. They display the greatest skill through the art of weaving baskets and their basketry reached such a degree of development that it might be placed among the higher arts.

Problem
The Chitimacha's craft is threatened by a shortage of native river cane populations. In addition, prior to this research, there were no river cane populations growing on the Chitimacha Reservation itself, which has shrunk to one-fourth of its established area in the mid-1800s.

Objective
The objective of this project is to evaluate the re-introduction and establishment of river cane (*Arundinaria sp.*) native to Chitimacha tribal lands to help sustain ancient cultural tradition.

Procedures
In February of 2001, vegetative divisions of *Arundinaria sp*. were collected from selected sites in St. Mary Parish. Initially, all accessions were thought to be species *Arundinaria gigantea*. Samples have been sent to authorities for more specific identification; however no definite conclusions have been drawn to date.

The plants were accessioned, further divided, planted into one gallon pots and grown for a period of one year. In March 2002, NRCS and the Chitimacha Tribe, with participation from the Chitimacha Tribal School, planted a total of 79 river cane plants at a site on the Chitimacha Reservation. Accession 9067613 was not planted because only one plant

survived in the greenhouse. Extra river cane plants not used in the 2002 planting were planted at the PMC in 'Field A2' for observation.
Measurements (height, number of small stems, number of large stems, diameter of the stems, and the diameter of the plants) were taken 14 days after planting and at 180 days after planting. In November 2004, the river cane was again measured.
Plants of some accessions were further collected in 2003 (9067604, 9067605, and 9067613) and in 2005 (9067604, 9067605, and 9067609). The 2005 collections were potted and are being grown out at the PMC.

Discussion
By 2004, most of the accessions grew and were doing well except for 9067609 and 9067612. When the measurements were first taken 2 weeks after planting in March 2002, 9067609 was grazed/browsed about 1-inch above the ground surface, apparently by animals. Some of the 9067612 plants did not survive in 2004. Accession 9067605 had the largest stem diameter, height, and number of small stems. Accession 9067610 had the largest number of large stems and 9067614 had the largest width of plants (diameter), followed closely by 9067605. Accession 9067605 was reported in 2001-2002 to be the most suitable river cane for weaving baskets and, overall, appeared to be the best accession for vegetative production, according to the measurements taken in 2004 (Table 2).

The PMC was successful in assisting the Chitimacha increase river cane populations; notable especially as these river cane collections are now on tribal lands. A review of the off-PMC planting site earlier in 2005 revealed excellent survival of the past plantings, with very good performance. The 2005-collected and potted plants, currently residing in a PMC greenhouse, have all successfully re-sprouted vegetative growth basally from rhizomes and laterally from nodes. These plants will eventually be planted on the reservation. Ongoing work will evaluate all past plantings and determine future usefulness to the Chitimacha tribe.

In 2009, there was a greater interest in the propagation of river cane and the management of existing stands. NRCS and the Chitimacha Tribe of Louisiana recognize the importance of river cane for use in traditional cultural arts such as basketry and additionally wildlife habitat, erosion control, windbreaks, and nutrient management. With the need to preserve a living cultural heritage, the NRCS is assisting to re-introduce and establish native river cane on Chitimacha tribal lands.

For 2010, the PMC obtained vegetative plant materials from the original collection sites with the cooperation of private landowners. Bare rooted plants will be used to establish designated tribal owned sites. Plant performance information will be used to develop planting and management guides. This information will be provided to the Chitimacha Tribal Council and NRCS Field Offices.

In March of 2011, the Louisiana Plant Materials Staff traveled to the Chitimacha Tribe of Louisiana's Reservation for a two day river cane project, which consisted of harvesting and further re-establishing river cane populations. The PMC staff, several volunteers and members of the Chitimacha tribe worked diligently to harvest the *Arundinaria tecta*

variety from a site located in St. Mary parish. The PMC staff dedicated an entire day to manually harvest river cane shoots for planting the following day. This planting was conducted in areas near wooded edges adjacent to the previous year's planting as requested by the tribe. PMC's labor and plant expertise resulted in successful populations of nearly 100 clumps of both river cane varieties. The initial objectives of the project were met by the establishment of the stands and colonies of river cane. This success will insure that the historical basket weaving traditions of the tribe be readily available.

In 2012, two meetings and field visits were conducted to discuss upcoming plantings. It was decided by the tribe that we plan for approximately 250 clumps of river cane to be harvested and planted on ridges in wooded areas. Previous plantings were visited and nearly all previous plantings have survived. Increasing the populations of river cane on other areas of the Reservation (locations to be recommended by the tribe) is another PMC project objective set for 2013.

In 2013, a meeting and field visit was conducted with NRCS and tribal members to discuss river cane plantings. The tribe requested the PMC assist in the extirpation of *Arundinaria tecta* from a nearby native location in order to increase the population on the reservation. Staff used sharp shooters to remove approximately 225 individual shoots of river cane that were then taken to the reservation. An excavator was used to prepare the site for planting. The areas were surveyed and staked out prior to planting. The shoots of river cane were planted on sandy, well drained ridges in the understory of hardwoods. Approximately 6 to 8 shoots were grouped and placed together in each hole to increase the survivability of the stand. 2 slow release fertilizer tablets were placed in each hole to enhance nutrient uptake. The following day, the town's fire department assisted by providing water to the plants in order to get proper soil root contact due to droughty conditions at the time. The site was visited recently and appears to have 90 percent survival.

Table 1. *Arundinaria sp.* accessions collected in 2001 from St. Mary Parish, Louisiana.

Accession number	Collection location
9067604	North side of Bayou Teche, Franklin, LA
9067605	Bayou Teche and Wax Lake outlet intersection
9067609	Northeast of Baldwin, LA
9067610	Southwest side of Franklin, LA
9067611	South of Highway 90 and Garden City, LA
9067612	South of Highway 90 and Garden City, LA
9067613	South of Highway 90 and Garden City, LA
9067614	Outside of Franklin, LA

Table 2. Ranking of data collected in 2004, from 2002 plantings on Chitimacha

Accession number	Stem Diameter	Height	Number of Small Stems	Number of Large Stems	Diameter of Plant
9067604	4	4	6	3	5
9067605	1*	1*	1*	4	2
9067609	7	7	7	6	7
9067610	2	2	5	1*	3
9067611	5	5	2	5	4
9067612	6	6	3	7	6
9067614	3	3	4	2	1*

Reservation (1* = best performance, 7 = worst performance, of group)**.**

Study: LAPMC-P-0802-CP

Study Title: Evaluation of *Sorghastrum nutans* (Indiangrass)

Study Leader: Morris Houck, NRCS Plant Materials Specialist, LA
Gary Fine, Bayou Land RC&D, LA
Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA

Cooperators: Nicholls State University, Thibodaux, LA

Introduction

Indiangrass is a perennial, warm-season grass, and is a major component of tallgrass prairies. It is widely distributed across the U.S and this species is an important species, in addition to big bluestem, little bluestem, and switchgrass, that are commonly found in the Coastal Prairies of Louisiana and Texas. Indiangrass is an important coastal prairie grass and there are no locally adapted seed sources commercially available for use in Louisiana.

Problem

There is a growing interest in the public and private sectors to utilize locally adapted native plant materials for restoration and re-vegetation projects in Louisiana. Ensuring ecosystem stability and ensuring genetic integrity is a major concern for restoration and habitat creation projects. Despite a strong demand for native plant material for conservation, restoration, and habitat creation, it is not available. Louisiana consumers must purchase less adapted plant material from Texas and the Midwest. Many restoration projects in Louisiana have failed or been unable to proceed because of the lack of commercially available sources of plant material that are adapted to the state.

Objective

Two integral parts to the LNPI are seed collection and the increase and production of seed. The LNPI uses observational and/or quantitative evaluations in addition to plant breeding methods to isolate and/or select improved local ecotypes. The LNPI uses the USDA-Natural Resources Conservation (NRCS) Service Plant Materials Program model for seed collection, increase, and release of adapted native grasses, forbs and legumes for commercial production.

Procedures
Seed collected from breeder blocks will be cleaned, debearded, and percent seed germination determined. Seed germination will be determined by counting out 100 seeds and placing in a Petri dish. 4 replications of 100 seeds are required. Conduct 2 tests and take an average for actual germination. Seeds will be germinated in a germination chamber set at 20°/30° C (16 hr. days/8 hrs. nights). Counts will be made at 7, 14, and 21 days. Finally, percent total germination will be calculated.

If germination percentage is low, place germination box in refrigerator at 38° F for 2 week stratification. After 2 weeks, place in germination chamber for standard germination trial.

Discussion
An assembly of Indiangrass was established at McNeese State University in 2004. The assembly originated from plant material collections made from remnant populations found in Louisiana's Coastal Prairie. The assembly was transplanted to Nicholls State University Farm in 2006. Five ramets from each of 22 accessions were planted to Block 1 in a completely randomized planting design. Plots consist of single plants spaced on 4 ft by 4 ft. centers. The assembly was managed for seed production in 2008. Hurricane Gustav hit the coast of Louisiana September 1. 2008. Thibodaux experienced hurricane force winds. The assembly was in the beginning stages of anthesis. Storm winds flattened the standing vegetation which did not recover, or stand upright and complete flowering. The storm's damages resulted in no seed production for the 2008 crop year.

October 12, 2009 seed was hand harvested from Nicholls State University Farm. Seed was then brought to the Plant Materials Center for processing. A total of 1.98 pounds was cleaned for 2009 seed crop.

The 2010 crop year, though still experiencing interior lodging, produced 3.0 bulk pounds (1.4 kg) of seed or an estimated 150 pounds (68 kg) per acre.

All established plots (110 each) remain vigorous and are persisting well. A fungal disease identified as *Puccini virgata* (rust) has been reported to be specific to Indiangrass, but has not been found in plots at the Nicholls Farm in Thibodaux, LA.

Indiangrass has been established at the following four locations. The status of this species can be found below for calendar years 2011 through 2013.

McNeese University – Louisiana Environmental Research Center (LERC) Lake Charles, Louisiana
One rod row for display garden was established. Plants are hardy and thriving, but not in seed production.

In 2012, approximately 4.7 grams of seed was harvested. Only 6 plants remain showing poor signs of plant vigor. Reasons for this decline may be a result due to the decrease of labor and weeds outcompeting Indiangrass.

In 2013 , due to loss of land lease this species has been distributed to other LNPI partner sites in multiple locations.

Nicholls State University (NSU) Thibodaux, Louisiana
Indiangrass breeders block at the Nicholls Farm is persisting and producing good seed crops through the 2011 growing season. The stand performed very well even through extremely dry weather conditions throughout much of 2011. Though Tropical Storm Lee winds laid flat over much of the blocks seed culms, about 30% still produced seed. Seeds were hand stripped from mature seed culms. Seed germination is pending.

In 2012, seed from 2011 crop was taken to the PMC and cleaned with the brushing machine and clipper. Total seed yielded 3.525lbs. The seed was then bagged, tagged and taken back to the NSU farm. A germination test was performed at the PMC to test seed viability. Results indicated that the seed had low viability, so PMC staff used a pneumatic needle seeder to plant 51 trays (98 cells each). Two to three seed were placed in each cell to insure germination. A bio fungicide medium was used and plants were then labeled and placed in GH1 where they received daily watering. Overall we had relatively good germination. Fertilizer such as 8-24-24 was applied 2-3 times per month. As plants grew, we then transplanted into larger pots. Once proper rooting and vegetative development was established, nearly 5000 plants were taken to NSU farm and transplanted in the field using a mechanical vegetable planter. The plants serve the purpose of seed increase for further expansion. Plants are well established and are looking good. Weeds and other pests are being controlled to prevent decline of Indiangrass.

In 2013, approximately 6 pounds of seed was thrashed using a mechanical seed cleaner at the PMC. Further cleaning is in progress and should yield results similar to the previous year.

University of Louisiana Lafayette – Center for Ecology and Environmental Technology (CEET) Carencro, Louisiana
A total of 11 rows currently exist at CEET. Plants exhibit hardy growth and prolific seed production. Like the other native warm season grasses, Indiangrass is hardy once established, and requires very little maintenance. Rust problems were treated successfully with a fungicide. Two rows were added to production by transplanting seedlings started in the greenhouse.

In 2012 an additional 5 rows were added. Seed came from production plant, grown in greenhouse, and then put in field. There was approximately 18lbs seed harvested.

In 2013, 3 rows of Indiangrass were added to the production block from seedlings grown in CEET greenhouses. Existing plants express great vigor and produced 2.1 pounds of cleaned seed.

East Texas Plant Materials Center (ETPMC) Nacogdoches, Texas
The ETPMC recently screened through a large, genetically diverse, collection of Indiangrass from eastern Texas including the coastal prairies for inclusion in a rust

screening study in an attempt to discover rust resistant Indian grasses for release and use in future breeding projects.

Study: LAPMC-P-0803-CP

Study Title: Evaluation of *Andropogon gerardii* (Big Bluestem)

Study Leader: Morris Houck, NRCS Plant Materials Specialist, LA
Gary Fine, Bayou Land RC&D, LA
Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA

Cooperators: Nicholls State University, Thibodaux, LA
McNeese State University, Lake Charles, LA

Introduction
Big bluestem is the dominant native grass species of the Midwestern tallgrass prairie and is widely distributed across the U.S. Big bluestem is also an important species found in the Coastal Prairies of Louisiana and Texas. There are no locally adapted seed sources of big bluestem available for planting in Louisiana. Native seed sources from remnant populations of big bluestem existing in Louisiana are generally found in small colonies that are not of sufficient size to harvest seeds for restoration.

Problem
There is a growing interest in the public and private sectors to utilize locally adapted native plant materials for restoration and re-vegetation projects in Louisiana. Ensuring both ecosystem stability and genetic integrity is a major concern for restoration and habitat creation projects. Despite a strong demand for native plant material for conservation, restoration, and habitat creation, it is not available. Louisiana consumers must purchase less adapted plant material from Texas and the Midwest. Many restoration projects in Louisiana have failed or been unable to proceed because of the lack of commercially available sources of plant material that are adapted to the state.

Objective
Two integral parts to the LNPI are seed collection and the increase and production of seed. The LNPI uses observational and/or quantitative evaluations in addition to plant breeding methods to isolate and/or select improved local ecotypes. The LNPI uses the USDA-Natural Resources Conservation (NRCS) Service Plant Materials Program model for seed collection, increase, and release of adapted native grasses, forbs and legumes for commercial production.

Procedures
Seed collected from breeder blocks in 2007 will be cleaned, de-bearded, and percent seed germination determined. Seed germination will be determined by counting out 100 seeds and placing in a Petri dish. 4 replications of 100 seeds are required. Conduct 2 tests and take an average for actual germination. Seeds will be germinated in a germination chamber set at 20°/30° C (16 hr. days/8 hrs. nights). Counts will be performed at 7, 14, and 21 days. Finally, total percent germination will then be calculated.

If germination percentage is low, place germination box in refrigerator at 38° F for 2 week stratification. After 2 weeks, place in germination chamber for standard germination trial.

Discussion

An assembly of populations sampled from coastal remnants was collected and planted at McNeese State University in 2004. Plant materials were taken from the McNeese planting to establish a crossing block consisting of 111 plants at Nicholls State University Farm July 13, 2006. Additional vegetative samples were taken from McNeese State University on June 18, 2007 and transplanted to the NSU Farm block to complete the assembly. Plant characterization data was collected for each plot in the assembly for the 2008 growing season. The stand of big bluestem is being managed for cross pollination and seed production to capture the potential genetic makeup of Louisiana ecotypes. Seed harvest was not completed this year due to Hurricane Gustav. Storm winds laid the standing seed culms flat, and plants did not recover. The seed crop was lost for 2008. Seeds harvested from the 2007 crop year will be used for planting the first foundation seed increase field (F1) at the NSU Farm.

October 21, 2009 seed was hand harvested from Nicholls State University Farm. Seed was then brought to the Plant Materials Center for processing. A total of 13.67 pounds was cleaned for 2009 seed crop.

Plant materials assembled and established exhibited excellent vigor and persistence for the duration of this project. Seeds harvested for the 2010 crop year appear to be the best production year to date. The seed lot was thrashed in early November, 2010 and hand screened to remove inert materials. Final processing has resulted in 40 bulk pounds (18.2 kg) of seed harvested from a 0.06 acre block (estimated 666 bulk pounds (302 kg) per acre. Germination tests will be used to determine pure live seed (PLS) as a measure of seed quality and yield this spring. The PLS determination will be used to efficiently plant an F1 foundation seed increase block in 2011.

Big bluestem has been established at the following four locations. The status of this species can be found below for calendar years 2011 through 2013.

McNeese University – Louisiana Environmental Research Center (LERC) Lake Charles, Louisiana

One rod row was established for display at LERC. Plants are thriving, but not utilized for seed production.

In 2012, the rod row is consisting of approximately 15 plants. The plants look good and 4.88 grams of seed was harvested for 2012.

In 2013 , due to loss of land lease this species has been distributed to other LNPI partner sites in multiple locations.

Nicholls State University (NSU) Thibodaux, Louisiana
Plants are persisting and producing excellent quantities of seed, but seed quality is poor. Seed production for 2011 was negatively impacted by Tropical Storm Lee. High winds hit the area when the breeders block was flowering. Most of the standing seed culms were laid flat. Only a few scattered plants remained upright. The 2011 seed crop was abandoned since so few seed culms matured and those did not show much seed fill.

In 2012, staff at the Golden Meadow Plant Materials Center used the brushing machine and clipper to clean the 2011 seed crop for the Big bluestem. Total seed clean equaled 2.715lbs. The seed was bagged and labeled then taken back to NSU Farm. Quick germination test were run at the PMC. Germination for the 2011 seed crop was poor to none.

In 2013, unseasonably wet conditions persisted throughout the majority of the growing season. The crop was successfully harvested and the PMC used a brushing machine and clipper to clean the seed. Total seed cleaned equaled 1.8 pounds.

East Texas Plant Materials Center (ETPMC) Nacogdoches, Texas
In 2010 several collections from NSU were shared with ETPMC to plant along with other collections from their service area. Plants are currently undergoing evaluation.

In 2012, 15 foot rod rows were added to existing plot. This added 10 rows from the existing plot. The plants were obtained from Nicholls State University, Thibodaux, LA.

Kisatchie National Forest (KNF) Bentley, Louisiana
Vegetative collections of five plant samples from each of the five KNF Units in central Louisiana are being assembled for planting at Stuart Seed Orchard. Total vegetative collections will be a minimum of 25 plants in the initial seed increase block.

University of Louisiana Lafayette – Center for Ecology and Environmental Technology (CEET) Carencro, Louisiana
In 2012, approximately 40 plants were extirpated from a nearby coastal prairie area and planted at CEET. The plants were placed in one row approximately 50 feet long. Few of these plants survived.

In 2013, one clump of Big bluestem was extirpated from a nearby LNPI partner site and then divided. The plants were used to create the first production row at CEET since, unfortunately, the previous year's attempt was unsuccessful. Further increase is planned for the future.

Study: LAPMC-P-0804-CP

Study Title: Evaluation of *Tripsacum dactyloides* (Eastern Gamagrass)

Study Leader: Morris Houck, NRCS Plant Materials Specialist, LA
Gary Fine, Bayou Land RC&D, LA
Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA

Cooperators: Nicholls State University, Thibodaux, LA
McNeese State University, Lake Charles, LA

Introduction

Eastern gamagrass is a stout, warm season, clump forming perennial grass. Leaves are wide and flattened, especially near the base. Foliage color ranges from dull to vivid green. Flowers grow along spikes with females below and males above. This fact leads some to believe that this is a predecessor to modern corn. Flowering occurs from May to November. Fruits develop in a jointed fashion and ripen independently as the plant matures.

Problem

There is a growing interest in the public and private sectors to utilize locally adapted native plant materials for restoration and re-vegetation projects in Louisiana. Ensuring both ecosystem stability and genetic integrity is a major concern for restoration and habitat creation projects. Despite a strong demand for native plant material for conservation, restoration, and habitat creation, it is not available. Louisiana consumers must purchase less adapted plant material from Texas and the Midwest. Many restoration projects in Louisiana have failed or been unable to proceed because of the lack of commercially available sources of plant material that are adapted to the state.

Objective

Two integral parts to the LNPI are seed collection and the increase and production of seed. The LNPI uses observational and/or quantitative evaluations along with plant breeding methods to isolate and/or select improved local ecotypes. The LNPI uses the USDA-Natural Resources Conservation (NRCS) Service Plant Materials Program model for seed collection, increase, and release of adapted native grasses, forbs and legumes for commercial production.

Procedures
Seed collected from breeder blocks in 2007 will be cleaned, debearded, and percent seed germination determined. Seed germination will be determined by counting out 100 seeds and placing in a Petri dish. 4 replications of 100 seeds are required. Conduct 2 tests and take an average for actual germination. Seed will be germinated in a germination chamber set at 20°/30° C (16 hr. days/8 hrs. nights). Counts will be performed at 7, 14, and 21 days. Finally, total percent germination will be calculated.

If germination percentage is low, place germination box in refrigerator at 38° F for 2 week stratification. After 2 weeks, place in germination chamber for standard germination trial.

Discussion
An assembly of plant collections made from endemic populations found throughout southeast Louisiana and northeast Louisiana has been established in Block 6. Random crossing blocks were established by using propagules from each collection. Considerable variation exists between ecotypes. Plant characterization data was collected during the 2008 growing season. Data will be used to identify germplasm that may have potential for specific uses such as grazing lands, hayland, bioenergy, wildlife habitat, riparian, and buffers. Seed was hand harvested from each plot in the assembly in August 2008. Seed weights will be measured and estimates of production by ecotype will be determined. The USDA NRCS East Texas Plant Materials Center will assist with germination and seed quality determinations.

July 14, 2009 seed was hand harvested from Nicholls State University Farm. Seed was then brought to the Plant Materials Center for processing. A total of 11 pounds was cleaned for the 2009 seed crop.

Seed crops for 2008 and 2009 were bulked together and planted in Field C on March 29, 2010. Unfortunately, no seedlings have been observed to date. The 2010 seed was hand harvested from Block A6 (Field A) on July 21, 2010 and processed.

Clean seed yielded 10 bulk pounds (4.5 kg) of seed from a 0.08 acre plot or estimated 125 pounds (57 kg) per acre. The current seed crop will be used to attempt another F1 Foundation seed increase block in Field C in late December 2010. A successful planting will be managed for seed production and subsequent seed distribution for field testing and field increase at other locations if shown promising for conservation use.

Eastern gamagrass has been established at the following three locations. The status of this species can be found below for calendar years 2011 through 2013.

McNeese University – Louisiana Environmental Research Center (LERC) Lake Charles, Louisiana
Two and a half rod rows for display at LERC (Louisiana Environmental Research Center). Plants are healthy and thriving, but not in seed production.

In 2013 , due to loss of land lease this species has been distributed to other LNPI partner sites in multiple locations.

Nicholls State University (NSU) Thibodaux, Louisiana

An assembly of plant collections made from endemic populations found throughout southeast Louisiana has been established to a breeders block. Seed crops have been hand harvested since 2008 crop year. Seed yields have been good, but seed quality is low. Seeds were hand collected more stringently in 2011 by making more frequent hand harvests only collecting the mature seed units as they were ready to shatter. An isolated F1 seed increase block was started in 2011. Two 250 linear foot rows have been planted and successfully established. Further increase will continue in 2012.

In 2012 quick germination checks were conducted at the PMC for the 2011 seed crop collected at NSU. Germinator setting fluctuated between 26-29°C. 7, 14, 21, & 28 day observations were made. PMC staff used a pneumatic needle seeder to plant 51 trays (98 cell tray) of Eastern gammagrass. A bio fungicide media was used and plants were placed in greenhouse in order to be automatically watered. 2 to 3 seeds per cell were planted to insure at least one plant was established per cell. The germinator percentage was less than half of what we planted. Plants were tended to and fertilized using started fertilizer (8-24-24) every 2 weeks. As plants grew they were then transplanted to larger celled trays. Once they were root bound in the trays, arrangements were made to bring them back to NSU for field planting. PMC staff used a mechanical vegetable planter to further establish the Eastern gammagrass plot at NSU. Approximately 2000 plants were planted next to already established Eastern gammagrass. Plants are looking good and weeds and other pests are under control.

In 2013, approximately 10 pounds of seed was thrashed using a mechanical seed cleaner at the PMC. Further cleaning is in progress and should yield results similar to the previous year.

University of Louisiana Lafayette – Center for Ecology and Environmental Technology (CEET) Carencro, Louisiana

Three rod rows have been in existence since 2008. Plants thrive well with little maintenance. Seed harvesting is tedious, usually by hand, but the species is not conducive to mechanical harvesting because seeds mature at different times over a period of about four to eight weeks.

In 2013, The original 3 rod rows (2008) are thriving, although seed quality seems to be declining. Four new production rows were added (2012) and are prospering. Although the spring of 2013 was unseasonably wet, the new plants reached impressive heights of 7 to 8 feet and seed production is better than expected. Seed viability is unknown at this time but should be promising.

Study: LAPMC-T-1001-CR

Study Title: Evaluation of selected plant materials and installation techniques to stabilize and control erosion along the South Lafourche Hurricane Protection Levee

Study Leader: Garret Thomassie, NRCS Plant Materials Center, LA
Curt J. Riche', NRCS Plant Materials Center, LA
Morris Houck, NRCS Plant Materials Specialist, LA

Cooperators: Windell Curole, South Lafourche Levee District, LA

Introduction

The South Lafourche Levee District was signed into existence in 1970 under the name of South Louisiana Tidal Water Control Levee District. In 1978 the name was changed to South Lafourche Levee District.

The South Lafourche Levee District office is located in Galliano, Louisiana. The hurricane protection system consists of over 48 miles of ring levee and has 33,400 acres within the flood protection system. There are 6 pumping stations within the system. The total acreage of the levee district exceeds 439,000.

Problem

The South Lafourche Levee District has made major improvements from Larose to the Golden Meadow Hurricane Protection System over the past year, and currently has several projects under construction in an ongoing effort to improve flood protection for the area.

Storm surges from the hurricanes of 2005 caused extensive damages to several existing levee systems across southern Louisiana where vegetative cover was weak or non-existent.

The hurricane season of 2008 again flooded a major portion of South Louisiana. In the South Lafourche Levee District, flood waters for Hurricane Gustav reached over 8 feet in the southern area with only a 2 foot surge reported near the Intracoastal Waterway. It was reported no flooding occurred within the existing system.

The South Lafourche Hurricane Protection Levee is in the process of constructing new levees and raising the effective height of existing levees to provide protection to the area. It is critical to find establishment and management techniques of grasses that will provide vegetative protection from tidal storm surges that could damage or weaken newly constructed storm protection levees.

Objective

This project targets the identified need by the Levee District to find cost effective solutions to establish and restore vegetative cover to existing and newly constructed levees. Factors that will be considered include:

- the evaluation of species useful for the re-vegetation of the levee
- the evaluation of planting techniques and bioengineering practices helpful in restoring cover
- evaluation of soil enhancement techniques to reduce compaction and improve soil health
- the development of publications and guidelines

Procedures

1. Species Evaluation Trials

Using the species as identified in Table 1 a detailed planting plan will be developed for study sites. Plant material will be installed as it relates to location inside and outside the hurricane protection levee (Figure2). Additional species may be added. Sites will be designed only to provide vegetative erosion control to protect the hurricane protection levee.

2. Evaluation of planting techniques and bioengineering practices

To evaluate the success of using various planting techniques as they relate to specific plant material. Techniques that will be considered include:

- No-till drill
- Brillion® Seeding
- Hydroseeding
- Improved broadcast methods

3. Evaluation of soil enhancement techniques to reduce compaction and improve soil health.

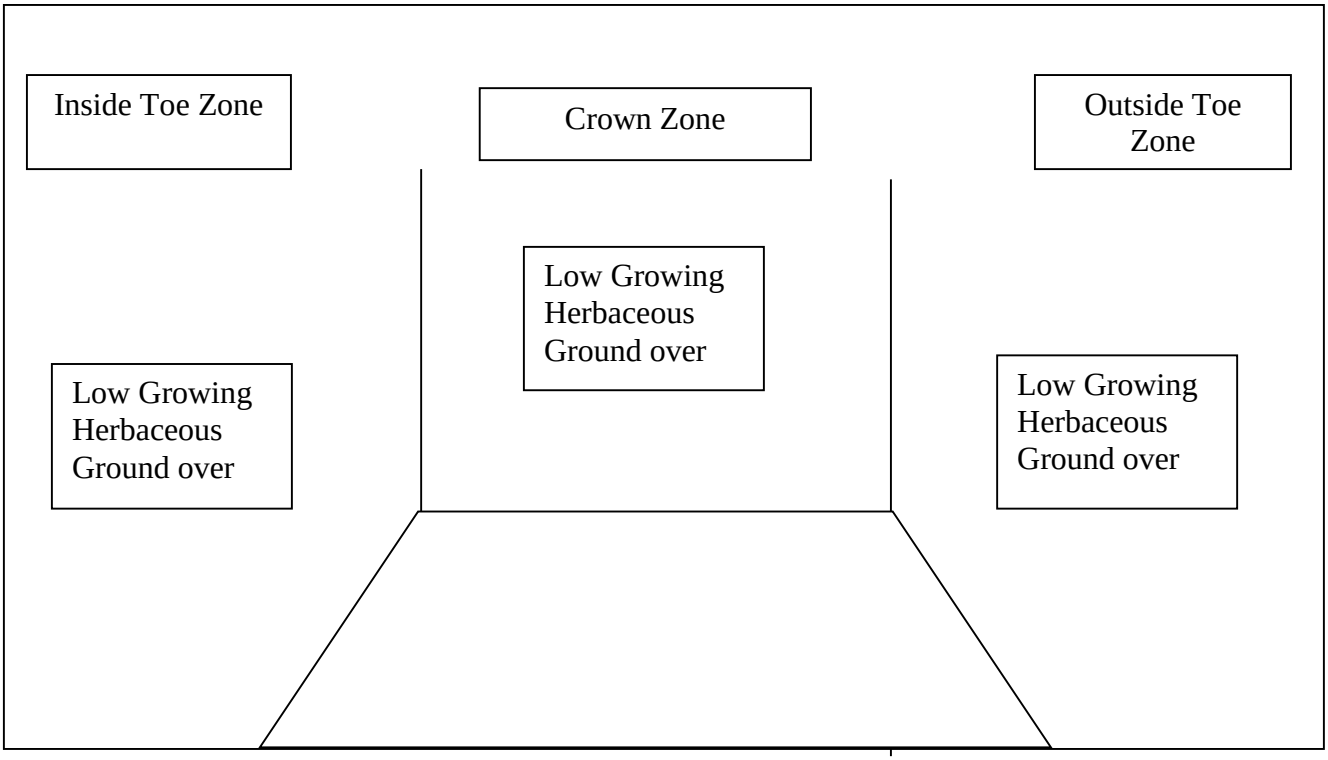
To evaluate the success of using various planting amendments to improve soil health:

- fertilizer amendments
- sprays
- mycorrhizal fungi

Table 1

Bahiagrass	Seed varieties; Pensacola, Argentine, TifQuik, Tifton 9
Bermudagrass	Seed varieties; Sahara, Pasto Rico
Bermuda/Bahiagrass blends	Seed
Bermuda/Bahiagrass blends w/cover crop	Fall/Winter Blend (bermudagrass, bahiagrass with annual ryegrass), Spring/Summer Blend (bermudagrass, bahiagrass with browntop millet)
Marshhay cordgrass (*Spartina patens*)	Vegetative variety - Gulf Coast
Seashore Paspalum (*Paspalum vaginatum*)	Seed
Switchgrass (*Panicum virgatum*)	Seed - Alamo (lower toe only)
Others as Identified	

Figure 2



Discussion

Study sites will be identified to evaluate species and techniques needed to establish and maintain the vegetative cover on levee systems. Levee elevations are increasing on average 4-5 feet above existing levels. Improvements will raise the levee from its current elevation of 10-11 feet depending on location to an elevation of 14-16 feet depending on location.

Study Site 1 – This site will be typical of the majority of the system that is being reworked to increase the effective height of the levee. This site will exhibit characteristics associated with compacted heavy soils. Seven plots will be installed to evaluate individual varieties and mixture.

March 24, 2010 - Plantings were performed and completed as outlined below. Cultipacking was somewhat difficult due to the high clay content of the soils. In addition to the heavy soils, droughty conditions did persist.

Plot Sizes

- 90 feet X 300 feet = .62 ac (45 feet either side of levee center line by 300 feet)
- 200 feet open between plots
- All plots seeded at 2X critical area rate (15lb/ac X 2 = 30 lb/acre rate, (30lbs X .62ac per plot = 18.6 lb/ac)

Plot 1 - Mixture - Bahiagrass/Bermudagrass/Browntop Millet Mixture

- Hancock Seed Spring/Summer Mix(April-October) - mixture of 33% Pensacola bahiagrass, 33% unhulled bermudagrass, and 34% browntop millet
- No-till drilled

Plot 2 - TifQuik Bahiagrass

- No-till drilled

Plot 3 - Mixture - Bahiagrass/Bermudagrass

- 50 % Sahara Bermudagrass and 50 % Pensacola Bahiagrass
- No-till drilled

Plot 4 - Pensacola Bahiagrass

- 25% seeded with No-till drill and 75% seeded with Brillion seeder

Plot 5 - Argentine Bahiagrass

- No-till drilled

Plot 6 - Mixture - Seedland Pasto Rico Bermudagrass Mixture

- 50% Giant Bermudagrass and 50 % common Bermudagrass
- No-till drilled

Plot 7 - Tifton 9 Bahiagrass

- No-till drilled

April 28, 2010 - Site evaluation to evaluate germination. No evidence of any seed germination. Abundant amounts of existing stands of bermudagrass and seashore paspalum are present.

August 6, 2010 - Site evaluation revealed the following observations.
Plot 1 - the west end had very little vegetation present. Across the remainder of the plot browntop millet observed at <5%, bermudagrass at <10% and bahiagrass at 0%.
Plot 2 - TifQuik Bahiagrass - 0% observed (Note - good stand of seashore paspalum)
Plot 3 - Mixture - Bahiagrass/Bermudagrass - bermudagrass <10%, bahiagrass 0%
Plot 4 - Pensacola Bahiagrass - 0% observed (Note - good coverage of bermudagrass)
Plot 5 - Argentine Bahiagrass - <10% mainly located within sediment accumulated in rills and through bermudagrass patches.
Plot 6 - Mixture - Seedland Pasto Rico Bermudagrass Mixture - < 10 % observed
Plot 7 - Tifton 9 Bahiagrass - 10 - 20% coverage

November 18, 2010 - Site evaluation revealed that existing stands (not planted) of bermudagrass and seashore paspalum were providing sufficient cover, and if managed properly, could potentially provide the protection needed. Although bahaigrasses were observed from planting, additional time is needed to fully evaluate its usage. Overall, the seed planted in respective plots germinated poorly. Factors related to soil compaction, drought conditions, and slope of planting sites are all believed to contribute to the low successes of the plantings.

Site evaluations were conducted in 2011 and revealed primarily natural stands (non-planted) of common bermudagrass. Additionally, the South Lafourche Levee District is currently under construction to elevate levees to the heights as surveyed by the Army Corps of Engineers. After the levee is elevated and sloped to desired specifications, the Golden Meadow Plant Materials Center will conduct further field trial plantings to address initial project objectives.

In 2012, the Golden Meadow Plant Materials Center provided and installed an erosion control matting to the crown zone of the levee in areas where the soil was unprotected. Approximately 1200 feet of levee was protected using this mat in order to aid in the seed stabilization so permanent vegetation could rapidly progress. The site was evaluated 3 months after the field trial with results showing complete coverage of healthy bermudagrass growing on the mats.

In 2013, the Golden Meadow Plant Materials made several site visits to monitor densities of grass on and near areas where erosion matting was placed the prior year. Dense heathly stands of commom bermudagrass populate nearly the entire area of where the matting was placed. Rhizomes seem to be elongating in other areas and filling in all gaps where soil had no vegetation. The Levee District continues in its efforts to elevate and reshape the levee system. Future studies similar to this one will provide solutions in plants and plant science technology so that when the levee is complete, it can also be vegetatively protected.

Study: LAPMC-T-1301-OT

Study Title: Evaluation of cultural techniques for propagating Black Mangrove for commercial production

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Introduction
Currently, black mangrove is commercially propagated by seed. High cost needed to heat greenhouses for seed propagation and/or other propagation areas has reduced the number of plant producers and increased plant cost. Finding a cost and time efficient method to propagate black mangrove using asexual methods will help increase grower interest and increase commercial production of black mangrove.

Problem
Soil - Soil erosion, coastal wetlands
Animal - Wildlife habitat
Water - Water Quality

Objective
Primary - Improve plant propagation
Secondary - Technology/development

Procedures
Plant cuttings from 5 year old black mangroves grown in greenhouses will be used to provide the 3 types of plant cuttings used for the study. Cuttings will be taken from the youngest (juvenile tissue) labeled 1st year, semi-woody labeled 2nd year and woody labeled mature. Three different strengths of Dip'N Grow rooting hormone will be used to determine which is more productive in promoting root development. (Mixture of 1:5, 1:10 and 1:20 parts water). The 3 types of cuttings will be labeled and planted in germination trays using ProMix with Biofungicide. Random numbers will be generated to determine 12 samples for each cutting/treatment to be evaluated on a weekly basis for 10 weeks.

Discussion
Data collected from this study will be summarized using Stat8 statistics program to determine best recommendations for commercial production using vegetative cuttings.

The purpose of this study was to discover which method would yield better results for commercial vegetative propagation of Pelican Germplasm black mangrove (*Avicennia germinans*). Finding the most time efficient and economically feasible method benefits both commercial growers' efforts to successfully propagate and be able to grow black mangrove throughout the year, without depending on seed. 3 types of stem cuttings were utilized for the study. Stem cuttings were extracted from selected phenotypically

attractive plants from 5 year old potted black mangrove plants. The 3 types of stem cuttings are as follows; 1st year, 2nd year and mature. All stem cutting types were treated with 4 types of treatments. A control, 1:5 rooting hormone to parts water (*T-1*), 1:10 rooting hormone to parts water (*T-2*), and a 1:20 rooting hormone to parts water (*T-3*). The rooting hormone used is commercially labeled as Dip'N Grow.

Optimal results were seen with 1st year stem cuttings treated with the (*T-2*) solution. Intermediate results were recorded for mature stem cuttings treated using the (*T-1*) solution. Poorest results were observed from the 2nd year stem cuttings. Stem cuttings from 2nd year yielded few results and some cuttings had either decayed in the tray or dropped all leaves and dried up before initial rooting results were observed in other stem cuttings.

In conclusion, this study proves successful vegetative propagation procedures for 1st year stem cuttings treated with a 1:10 solution of Dip'N Grow rooting hormone to parts water, shows the highest percent rooting for commercial production. Pending statistical analysis for this study should reveal similar results, confirming initial observations.

1st Year Cuttings	Control	T1 Treatment	T2 Treatment	T3 Treatment
2nd Year Cuttings	Control	T1 Treatment	T2 Treatment	T3 Treatment
Mature Cuttings	Control	T1 Treatment	T2 Treatment	T3 Treatment

*Yellow blocks represent top performers pending statistical analysis.

For more information call us at 985.475.5280 or visit our web site at http://www.plant-materials.nrcs.usda.gov/lapmc